

Aircrew & Flightline Tasks



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Developed as part of the
National Emergency Services Curriculum Project

LOCATE A POINT ON A MAP USING LATITUDE AND LONGITUDE

CONDITIONS

Given an aeronautical chart, road map, or topographical map with latitude and longitude lines. You are away from mission base, mounted or dismounted, and must locate your location on map in order to report your location to mission base, an aircraft or another ground element using latitude and longitude. Or, you are coordinating with another search element (ground or air) who has told you his location using the latitude and longitude. You want to plot this point on your map.

OBJECTIVES

Within 1 minute, the team member announces the correct latitude and longitude of the marked point (using the smallest gradations of latitude and longitude printed on the map), using correct terminology, and, within 1 minute, can plot a point on the map given the latitude and longitude orally.

TRAINING AND EVALUATION

Training Outline

1. Latitude and longitude are the objective position measurements used on aeronautical charts. Many road maps and topographical maps also are gridded using this system.
 - a. Lines of longitude run north-south on the map. Lines of latitude run east-west.
 - b. Both latitude and longitude are measured in degrees, minutes and seconds. One minute is 1/60th of a degree, and one second is 1/60th of a minute. In the continental US, latitude numbers are read from south to north (bottom to top), and longitude numbers are read from east to west (right to left)
 - c. Each line of latitude is labeled as either North (if it is above the equator) or South (if it is below the equator). Each line of longitude is labeled as East (if it is east of a longitude line called the Prime Meridian) or West (if it is west of the Prime Meridian)
 - d. To read a lat-long coordinates the symbol “°” means degrees, an apostrophe (“ ’ ”) means minutes, and a double apostrophe (“ ”) means seconds. Always read the latitude before the longitude.
 - e. Example: 32° 33’ 44” N, 45° 12’ 52” E means “32 degrees, 33 minutes, and 44 seconds North Latitude, 45 degrees 12 minutes and 52 seconds East Longitude”
 - f. On larger scale maps, or when pinpoint accuracy is not required, seconds are not used. For example, 45° 12’ N, 22° 36 W is read as “45 degrees, 12 minutes North Latitude, 22 degrees 36 minutes West Longitude.”
2. To find the lat-long designation of a known point on the map
 - a. Find the latitude:

1) Find the numbers of the latitude degree lines to the immediate north and south of the point. Write down the lower of the two. (For example, if the point is between 45° and 46° North latitude, write down

“45°“. Also write down if that latitude line is labeled as “North” or “South” (above the equator it will always be “North”).

2) From latitude line chosen above, count up the number of minutes that the point is from the line using the tick marks on the edge of the map (or in the grids if the map is gridded) until you reach the last minute marking before your point. Write down the number of minutes.

3) From the last minute mark, count up the number of seconds to your point (if the map is of a large scale, such as an aviation chart, it will not have marks for seconds. Either stop with the minute measurement, or estimate seconds). Write down the number of seconds.

b. Find the longitude.

1) Find the numbers of the longitude degree lines to the immediate east and west of the point. Write down the lower of the two. (For example, if the point is between 22° and 23° West longitude, write down “22° “). Also write down if that longitude line is labeled as “East” or “West” (in the western hemisphere it will always be “West”).

2) From longitude line chosen above, count left the number of minutes that the point is from the line using the tick marks on the edge of the map (or in the grids if the map is gridded) until you reach the last minute marking before your point. Write down the number of minutes.

3) From the last minute mark, count left the number of seconds to your point (if the map is of a large scale, such as an aviation chart, it will not have marks for seconds. Either stop with the minute measurement, or estimate seconds). Write down the number of seconds.

c. NOTE: If the map is not marked with minutes or seconds, you will have to estimate. Remember, there are 60 minutes in a degree and 60 seconds in a minute. So, if the point is halfway between two degrees, it is at the 30 minute point. If it is one quarter the distance from one degree to another, it is at the 15 minute point. Use the same logic to determine seconds if the map is only graduated in degrees and minutes.

c. Make sure the lat-long coordinate you have written down is in the format Degrees°, Minutes’, Seconds” (North or South) Latitude, Degrees°, Minutes’, Seconds” (East or West) Longitude,

3. To plot a point given the lat-long coordinate:

a. Find the correct latitude line and count up the correct number of minutes and seconds (below the equator you would count down, not up).

b. Find the correct longitude line and count left the correct number of minutes and seconds (in the eastern hemisphere you would count right, not left).

c. Mark the point.

Additional Information

More detailed information on this topic is available in the Ground Team Member and Leader Reference Text and Mission Aircrew Reference Text.

Evaluation Preparation

Setup: Mark a point on a map or chart gridded with latitude and longitude, and give the map to the student. . Tell him whether or not he must report seconds, or just degrees and minutes (depends on the scale of the map). Pick a different grid location from the point and write down the latitude and longitude coordinates. Ensure you have a timer. Because this task is timed, it is necessary to make sure that the student and work area is prepared for testing. The map should be open and complete. If copies of maps are used, they should include all references normally available on the full map to take the exam.

Brief Student: Ask the student if he is prepared. Tell the student to tell you the latitude and longitude of the point. Then orally give him the latitude and longitude you wrote down and tell him to show you where that point is on the map.

Evaluation

Performance Measures

Results

Determining the grid of a known point. The student:

- | | | |
|--|---|---|
| 1. Announces the correct latitude degrees, minutes and seconds within tolerance (see below) | P | F |
| 2. Announces the correct latitude designation "North" or South" | P | F |
| 3. Announces the correct longitude degrees, minutes and seconds within tolerance (see below) | P | F |
| 4. Announces the correct longitude designation "East" or "West" | P | F |
| 5. Performs the above steps within 1 minute of time | P | F |

NOTE: The minimum accuracy for this task is to be within 30 seconds of the correct answer for a map graduated in minutes. If the map is large enough scale to be graduated in seconds, then the needed accuracy should be increased. For dismounted work, a ground team with proper maps should be able to plot positions within 10 seconds.

The individual determines the location of a designated grid:

- | | | |
|---|---|---|
| 6. Plots a point on the map within 1 minute using the correct latitude and longitude degrees, minutes and seconds within tolerance (see accuracy note above). | P | F |
|---|---|---|

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

LOCATE A POINT ON A MAP USING THE CAP GRID SYSTEM**CONDITIONS**

Given an aeronautical chart, road map, or topographical map gridded with the CAP grid system. You are away from mission base, mounted or dismounted, and must plot your location on a CAP gridded map in order to report it, an aircraft or another ground element. Or, you are coordinating with another search element (ground or air) who has told you his location using the CAP grid system. You want to plot this point on your map.

OBJECTIVES

Within 1 minute, the team member announces the CAP grid and sub-grid that the point is located in, using correct terminology, and can plot a point on the map given the CAP grid coordinates orally.

TRAINING AND EVALUATION**Training Outline**

1. The CAP grid system is designed for use on aeronautical charts, but can be adapted to any map with latitude/longitude markings around the edge.
2. A grid is a 15 minute latitude by 15 minute longitude box. This is done by dividing the 30 minute by 30 minute boxes already on the aeronautical chart into fourths. Each grid is identified with a number. (For example "I am located in Grid 54").
3. To locate a position more precisely, mentally divide each grid into four quadrants. The Northwest quadrant is "A", the Northeast is "B", the Southwest is "C", and the Southeast is "D". Say the quadrant letter after the grid number (for example, "I am in grid 54 B").

54	55
82	<div> <div>83</div> <div> <div>A</div> <div>B</div> <div>C</div> <div>D</div> </div> </div>

Example of CAP grids (54,55,82 and 83) and lettered quadrants (83A, 83B, 83C, and 83D)

4. To find the grid designation of a known point on the map
 - a. Find the grid number the point is in.

b. Determine which quadrant of the grid the point is in (A, B, C, or D)

5. To plot a point given a grid number and quadrant letter:

a. Find the appropriate grid on the map (the grid numbers increase as you look left to right and top to bottom on the map).

b. Mark the point in the appropriate lettered quadrant of that grid.

Additional Information

More detailed information on this topic is available in the Ground Team Member and Leader Reference Text and the Mission Aircrew Reference Text.

Evaluation Preparation

Setup: Mark a point on a CAP gridded map or chart and give the map to the student. Pick a different grid location from the point and write down the grid and quadrant. Ensure you have a timer.

Brief Student: Tell the student to tell you the CAP grid and quadrant designation of the point. Then orally give him the grid and quadrant of the point you wrote down and tell him to show you where that point is on the map.

Evaluation

Performance Measures

Results

The individual determines the grid of a known point:

1. Announces the correct grid number and quadrant within 1 minute

P F

The individual determines the location of a designated grid:

2. Finds the correct numbered grid and quadrant within 1 minute

P F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

O-2016
DEMONSTRATE SAFETY WHILE TAXIING

CONDITIONS

You are a Mission Scanner trainee and must demonstrate safety techniques while taxiing in an aircraft.

OBJECTIVES

Demonstrate safety while taxiing, including airport signs and markings and flightline hand signals.

TRAINING AND EVALUATION

Training Outline

1. As a Mission Scanner trainee, knowledge of safety during taxiing is essential. *All crewmembers should assist the pilot while taxiing.* The pilot should brief each crewmember on what direction he or she should look out the aircraft. Sterile cockpit rules are in effect, so the crew should limit their conversation to the task at hand. Report conflicts to the pilot immediately, using the "clock position" method.

- a. Maintain adequate clearance from obstacles.
- b. When taxiing within 10 feet of obstacles stop, and then proceed no faster than a slow walk.
- c. If available, use marshallers or a "wing walker."
- d. Potential collisions with other aircraft or vehicles.
- e. Stay on or find the taxiway. At night or under low visibility conditions, assist the pilot. Some smaller airports do not mark their taxiways or the paint may be faded.

2. Runway markings are white and taxiways are yellow. Taxiway centerlines are solid yellow. Some taxiway boundaries are marked with double yellow lines while others have blue lights or cones.

3. Mandatory signs have a red background with a white inscription, and are used to denote an entrance to a runway or critical area where an aircraft is prohibited from entering without ATC permission:

- a. Holding position for a runway. Do not cross without ATC permission.
May have a row of red stop bar lights, embedded in the pavement and extending across the taxiway at the runway holding position. When illuminated they designate a runway hold position: never cross a red illuminated stop bar, even if cleared by ATC.
- b. Holding position for approach area. Do not cross without ATC permission.
- c. Holding position for instrument landing system. Do not cross without ATC permission.
- d. No entry. Typically placed on a one-way taxiway or at the intersection of vehicle roadways that can be mistaken for a taxiway.

15-33

15-APCH

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4. Holding position marking for runway boundary. Four yellow lines: two solid and two dashed. The aircraft approaches the dashed lines and stops behind the solid lines (ensures you do not enter the runway). Do not cross without ATC permission. When exiting the runway, the pilot should cross the dashed lines to make sure the aircraft is completely clear of the runway.

May have yellow clearance bar lights embedded in the pavement to indicate a hold point. May have flashing yellow guard lights elevated or in-pavement at runway holding positions.



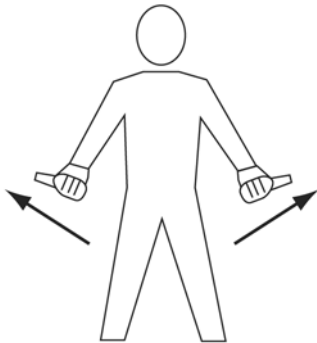
5. Location signs are used to identify either a taxiway (letters) or runway (numbers) on which an aircraft is located, or to provide a visual clue to the aircrew when the aircraft has exited an area:



6. Direction signs gave a yellow background with a black inscription.



7. Ground crew use hand signals to help direct pilots during taxi operations. The scanner should be familiar with these signals in order to increase safety during taxiing and parking:



Outward motion with thumbs.
PULL CHOCKS



Circular motion of right hand at head level with left arm pointing to engine.
START ENGINE



Raise arm, with fist clenched, horizontally in front of body, and then extend fingers.
RELEASE BRAKE



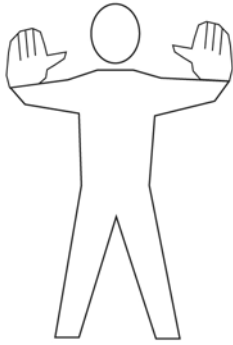
Thumb Up.
OK or YES



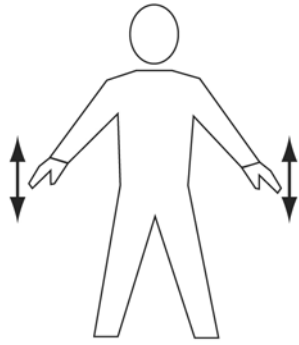
Thumb Down.
NOT OK or NO



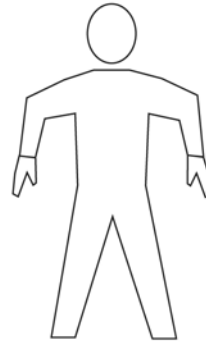
Arms above head in vertical position with palms facing inward. **THIS MARSHALLER**



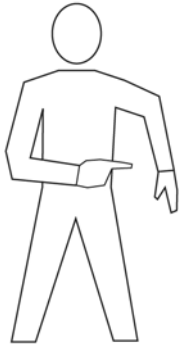
Arms a little aside, palms facing backwards and repeatedly moved upward and backward from shoulder height. **MOVE AHEAD**



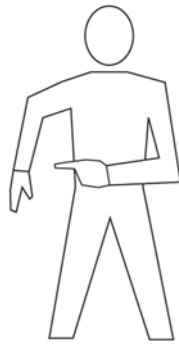
Arms down with palms toward ground, then moved up and down several times. **SLOW DOWN**



Arms extended with forearm perpendicular to ground. Palms facing body. **HOT BRAKES**



Arms extended with forearm perpendicular to ground. Palms facing body. Gesture indicates right side. **HOT BRAKES - RIGHT**



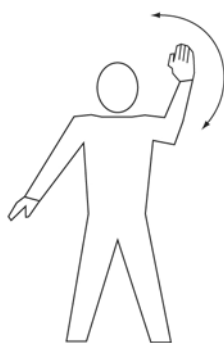
Arms extended with forearm perpendicular to ground. Palms facing body. Gesture indicates left side. **HOT BRAKES - LEFT**



Waiving arms over head. **EMERGENCY STOP**



Right or left arm down, other arm moved across the body and extended to indicate direction of next marshaller. **PROCEED TO NEXT MARSHALLER**



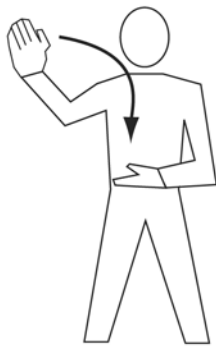
Point right arm downward, left arm repeatedly moved upward-backward. Speed of arm movement indicating rate of turn. **TURN TO THE LEFT**



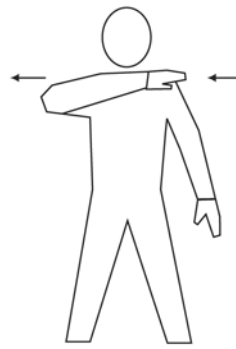
Point left arm downward, right arm repeatedly moved upward-backward. Speed of arm movement indicating rate of turn. **TURN TO THE RIGHT**



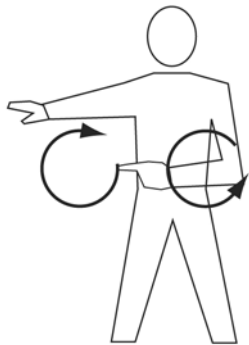
Arms crossed above the head, palms facing forward. **STOP**



Make a chopping motion with one hand slicing into the flat and open palm of the other hand. Number of fingers extended on left hand indicates affected engine.
FEATHER / FUEL SHUT-OFF



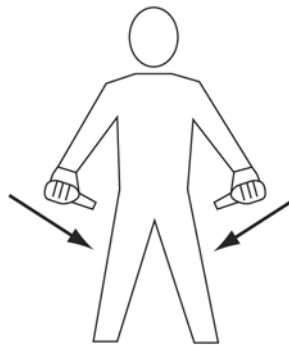
Either arm and hand level with shoulder, hand moving across throat, palm downward.
CUT ENGINES



Make rapid horizontal figure-eight motion at waist level with either arm, pointing at source of fire with the other.
FIRE ONBOARD



Raise arm and hand, with fingers extended horizontally in front of the body, then clench fist.
ENGAGE BRAKE



Inward motion with thumbs.
INSERT CHOCKS



Right arm raised with elbow at shoulder height with palm facing forward.
MARSHALLER

Additional Information

More detailed information on this topic is available in Chapter 2 and Attachment 2 of the MART.

Evaluation Preparation

Setup: Provide the trainee access to airport signs and markings (pictures may be used) and someone to give flightline hand signals.

Brief Student: You are a Scanner trainee asked about safety during taxiing.

Evaluation

<u>Performance measures</u>	<u>Results</u>	
1. Discuss the safety rules used to avoid obstacles during taxiing.	P	F
2. Discuss the sterile cockpit rules and how you would point out an obstacle.	P	F
3. State the difference between runway and taxiway markings.	P	F
4. Identify mandatory signs and discuss their meaning.	P	F
5. Identify holding position markings and discuss their meaning.	P	F
6. Identify location and direction signs and discuss their meaning.	P	F
7. Recognize flightline hand signals.	P	F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

O-2018
OPERATE THE AIRCRAFT COMMUNICATIONS EQUIPMENT

CONDITIONS

You are a Mission Scanner trainee and must operate and discuss the aircraft communications equipment.

OBJECTIVES

Demonstrate basic knowledge and use of the aircraft communications radios and the CAP FM radio.
Demonstrate how to set up the audio panel to use the radios.

TRAINING AND EVALUATION

Training Outline

1. As a Mission Scanner trainee, basic knowledge of aircraft communications equipment is essential. Although you will probably only use the FM radio during missions, knowledge of how to use the other communications equipment could prove very important during emergencies.
2. Aircraft radios. The radios used in CAP aircraft are normally combined with navigation receivers, and so are often referred to as "nav/comm" radios. Each radio (there are usually two) has a 'primary' and a 'standby' function (called "flip-flop"): the primary frequency is displayed on the left and the standby frequency on the right. To use a frequency it must be in the primary display; to change a frequency, it must be in the standby display. The frequencies are normally tuned in increments of 50 kilocycles, for example 119.70 or 119.75 (the last '0' is not displayed). They can also be tuned in increments of 25 kilocycles by pulling out on the tuning knob and turning, but the last '5' will not be shown in the display (e.g., 119.775 will be displayed as 119.77). Sometimes, for brevity, air traffic controllers assign such frequencies as "one-one nine point seven seven," meaning 119.775, not 119.770. The operator cannot physically tune the radio to 119.770, and this may be confusing.



3. Before transmitting on any radio, first *listen* to the selected frequency. An untimely transmission can "step on" another transmission from either another airplane or ground facility, so that *all* the transmissions are garbled. Next, mentally prepare your message so that the transmission flows naturally without unnecessary pauses and breaks (think "Who, Where and What"). You may even find it helpful to jot down what you want to say before beginning the transmission. When you first begin using the radio, you may find abbreviated notes to be a convenient means of collecting thoughts with the proper terminology. As your experience level grows, you may find it no longer necessary to prepare using written notes.
4. CAP aircraft callsigns are pronounced "Cap Flight XX XX," where the numbers are those assigned to each Wing's aircraft. *The numbers are stated in 'group' form.* For example, the C172 assigned to Amarillo, Texas is numbered 4239, where 42 is the prefix identifying it as a Texas Wing aircraft. The callsign is thus pronounced "Cap Flight Forty-Two Thirty-Nine." It is important to use the group form of pronunciation because FAA air traffic controllers expect it of us.
5. CAP VHF FM radio. This radio is dedicated to air to ground communications, and is normally operated by the observer or scanner. Several of the frequencies programmed into the radio are frequencies assigned to CAP by the U.S. Air Force, and are used to communicate with CAP bases and ground teams. Others are

programmed at the direction of the Wing Communications Officer (e.g., mutual aid, fire, police, park service, forest service, and department of public service); these frequencies almost always require prior permission from the controlling agency before use.

There are currently three types of FM radios in use in the CAP fleet at this time. Refer to your aircraft's operating manual for specific details for its use. Chapter 4 of the *Mission Aircrew Reference Text* provides directions on the use of the TDFM-136.

6. Audio panel. The audio panel serves as the 'hub' of radio communications in the aircraft, and is normally set up by the pilot or observer. The scanner needs to know how to select the 'active' aircraft communications radio for transmission. The active radio is selected with the switch on the right-hand side of the panel. Select either COM 1 or COM 2 to transmit and receive on the frequency displayed in the associated radio's primary display.



Additional Information

More detailed information on this topic is available in Chapter 4 of the MART.

Evaluation Preparation

Setup: Provide the student access to aircraft radios or detailed figures.

Brief Student: You are a Scanner trainee asked about using the aircraft radios.

Evaluation

<u>Performance measures</u>	<u>Results</u>	
1. Demonstrate how to enter a frequency and use the aircraft communications radios.	P	F
2. Discuss the importance of listening before transmitting, and basic message format.	P	F
3. Demonstrate proper use of the CAP aircraft callsign.	P	F
4. Demonstrate how to select a frequency and use the CAP FM radio.	P	F
5. Demonstrate setting up the audio panel to transmit on an aircraft radio.	P	F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

DEMONSTRATE SCANNING PATTERNS AND LOCATE TARGETS

CONDITIONS

You are a Mission Scanner trainee and must use scanning patterns to locate targets.

OBJECTIVES

Use proper scanning patterns to locate an object and a person on the ground.

TRAINING AND EVALUATION

Training Outline

1. As a Mission Scanner trainee, the ability to use proper scanning patterns to locate objects on the ground is essential. Scanning is the process of investigating, examining, or checking by systematic search. In search and rescue operations, the scanner visually searches for distress signals or accident indications by using a systematic eye movement pattern. Refer to Chapter 5 of the MART for figures.

2. Vision. The brain actively senses and is aware of everything from the point outward to form a circle of 10 degrees (visual acuity outside of this cone of vision is only ten percent of that inside the cone). This is central vision, produced by special cells in the fovea portion of the eye's retina. Whatever is outside the central vision circle also is "picked up" by the eyes and conveyed to the brain, but it is not perceived clearly. This larger area is called peripheral vision; cells less sensitive than those in the fovea produce it. For example, an object that is visible one mile away using central vision would only be visible 500 feet away using peripheral vision. However, objects within the peripheral vision area can be recognized if mental attention is directed to them.

Note that peripheral vision is very important at night, and is also important in picking up structures such as towers.

3. Fixation area. The fixation area is the area in which "concentrated" looking takes place. If the search objective happens to come within this fixation area, you probably will recognize it. For central vision to be effective, the eye must be focused properly. This focusing process takes place each time the eyes, or head and eyes, are moved. When you are not actively focusing while looking outside the aircraft, your focal point will be a point about 30 feet out. Thus, daydreaming or thinking about other things while you are supposed to be looking for the target will guarantee you will not see the target even if your eyes are pointed right at it!

4. Fixation points and lines of scan. When you wish to scan a large area, your eyes must move from one point to another, stopping at each point long enough to focus clearly. Each of these points is a fixation point. When the fixation points are close enough the central vision areas will touch or overlap slightly. Spacing of fixation points should be 3 or 4 degrees apart to ensure the coverage will be complete. Consciously moving the fixation points along an imaginary straight line produces a band of effective "seeing."

5. Fixation area. The goal of scanning techniques is to thoroughly cover an assigned search area. Reaching this goal on a single overflight is not possible for a number of reasons. First, the eye's fixation area is a circle and the search area surface (ground) is flat. Coverage of a flat surface with circles requires much overlapping of the circles. This overlapping is not possible on a search mission because of the aircraft's motion. Also, the surface area covered by the eye's fixation area is less for the area near the airplane and increases with distance from the airplane. The net result is relatively large gaps in coverage near the airplane and some overlap as distance from the airplane increases. Angular displacement is the angle formed from a point almost beneath the airplane outward to the scanning range, or beyond. By this definition, the horizon would be at 90 degrees

displacement. Although the fixation area may be a constant 10-degree diameter circle, the effectiveness of sighting the objective decreases with an increase in this angular displacement. Said another way, your ability to see detail will be excellent at a point near the aircraft, but will decrease as the angular displacement increases. At the scanning range, at which the angular displacement may be as much as 45 degrees, the resolution of detail area probably will have shrunk to a 4-degree diameter circle. This is why having scanners looking out both sides of the aircraft is optimal. With track spacing (explained later) proper for the given search visibility, each scanner will look at roughly the same area (i.e., double coverage).

6. Field of scan. The area that you will search with your eyes in lines of scan is called the field of scan. The upper limit of this field is the line that forms the scanning range. The lower limit is the lower edge of the aircraft window, while the aft (back) limit is usually established by the vertical edge of the aircraft window. The forward (front) limit for a field of scan will vary. It might be established by a part of the airplane (such as a wing strut). Or, when two scanners are working from the same side of the airplane it might be limited by an agreed-upon point dividing the field of scan.

7. Scanning range. We are using the term "scanning range" to describe the distance from an aircraft to an imaginary line parallel to the aircraft's ground track (track over the ground.) This line is the maximum range at which a scanner is considered to have a good chance at sighting the search objective.

Scanning range sometimes may be confused with search visibility range. Search visibility range is that distance at which an object the size of an automobile can be seen and recognized. Aircraft debris may not be as large as an automobile and may not be immediately recognizable as aircraft debris, particularly when the aircraft is flying at 100 mph. Therefore, scanning range may be less than but never greater than the search visibility (in CAP searches, we rarely credit a search visibility of greater than three or four nautical miles).

If your pilot states that the search altitude will be 500 feet above the ground level (AGL), you can expect your scanning range to be $\frac{1}{4}$ to $\frac{1}{2}$ mile. If the search altitude is 1,000 feet AGL, you can expect a scanning range of between $\frac{1}{2}$ and 1 mile. Even so, there are many variables that affect both the effective scanning range and your probability of detecting the search objective. These issues are discussed later.

8. Scanning patterns. To cover the field of scan adequately requires that a set pattern of scan lines be used. Research into scanning techniques has shown that there are two basic patterns that provide the best coverage. These are called the *diagonal pattern* and the *vertical pattern*. The diagonal pattern is the better of the two.

The diagonal pattern begins with the first fixation point slightly forward of the aircraft's position, and the scanner moves her fixation points sequentially back toward the aircraft. The next scan line should be parallel to the first, and so on. Each succeeding scan line is started as quickly as possible after completing the previous one. Remember, the duration of each fixation point along a scan line is about $\frac{1}{3}$ second: how long it takes to complete one scan line depends on the distance at which the scanning range has been established. Also, the time required to begin a new scan line has a significant influence on how well the area nearest the airplane is scanned. In other words, more time between starting scan lines means more space between fixation points near the airplane.

The vertical pattern is somewhat less effective. You should use this pattern only from a rear seat position, and the first fixation point should be as near to underneath the airplane as you can see. Subsequent fixation points for this first scan line should progress outward to the scanning range and back. This scanning pattern traces a "sawtooth" shape on the surface.

Note: If there are two scanners on the same side of the airplane, it is good practice to combine the diagonal and vertical patterns. As agreed between scanners, one would use the diagonal pattern and the other the vertical pattern. However, the scanner using the vertical pattern *would not* scan to the scanning range. Some distance

short of the scanning range would be selected as the vertical pattern limit. This technique provides good coverage of the surface area near the search aircraft.

Additional Information

More detailed information and pictures on this topic are available in Chapter 5 of the MART.

Evaluation Preparation

Setup: Provide the student with an aircraft and aircrew (scanning techniques may be simulated on the ground).

Place a target (preferably to simulate aircraft wreckage) in the search area, and have a person (or mannequin) in the same general area. Fly the search area at 1000' AGL and 90-100 knots.

Brief Student: You are a Scanner trainee asked to demonstrate scanning patterns and locate targets in a search area.

Evaluation

<u>Performance measures</u>	<u>Results</u>	
1. Define "scanning" and "fixation," and describe how aircraft motion effects scanning.	P	F
2. Demonstrate knowledge of central and peripheral vision, and describe where your focal point is when your eyes are relaxed.	P	F
3. Demonstrate knowledge of fixation points and lines of scan, and define "scanning range."	P	F
4. Demonstrate diagonal and vertical scanning patterns.	P	F
5. Locate a target in a search area.	P	F
6. Locate a person in a search area.	P	F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

O-2023
DEMONSTRATE TECHNIQUES TO REDUCE FATIGUE

CONDITIONS

You are a Mission Scanner trainee and must demonstrate and discuss how to minimize fatigue.

OBJECTIVES

Demonstrate techniques to minimize fatigue, and how you would direct the pilot during flight.

TRAINING AND EVALUATION

Training Outline

1. As a Mission Scanner trainee, knowing how to minimize fatigue is essential. The art of scanning is more physically demanding and requires greater concentration than mere sight seeing. In order to maintain scanning effectiveness you must be aware of your own fatigue level. The following can help maintain scanning effectiveness:
 - a. Change scanning positions at 30- to 60-minute intervals, if aircraft size permits.
 - b. Rotate scanners from one side of the aircraft to the other, if two or more scanners are present.
 - c. Find a comfortable position, and move around to stretch when necessary.
 - d. Clean aircraft windshields and windows. Dirty windows accelerate the onset of eye fatigue, and can reduce visibility by up to 50 percent.
 - e. Scan through open hatches whenever feasible.
 - f. At night, use red lights and keep them dimmed to reduce reflection and glare.
 - g. Use binoculars (sparingly) to check sightings.
 - h. Focus on a close object (like the wing tip) on a regular basis. The muscles of the eye get tired when you focus far away for an extended period of time.
 - i. Rest during turns outside the search area.
2. The "clock position" system is used to describe the relative positions of everything outside the airplane, with the nose of the aircraft being "12 o'clock." The system considers positions to be on a horizontal plane that is centered within the cockpit, and any object above or below this plane is either "high" or "low."

Additional Information

More detailed information on this topic is available in Chapter 5 of the MART.

Evaluation Preparation

Setup: Provide the student access to an aircraft (may simulate on the ground).

Brief Student: You are a Scanner trainee asked how to minimize fatigue during searches.

Evaluation

<u>Performance measures</u>	<u>Results</u>
1. Discuss fatigue effects and demonstrate how to minimize fatigue.	P F
2. Describe how to direct the pilot using the "clock position" method.	P F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

TRACK AND RECORD POSITION ON SECTIONALS AND MAPS**CONDITIONS**

You are a Mission Scanner trainee and must demonstrate basic use of navigational terms, determine heading and distance, and determine the position of the aircraft and ground features.

OBJECTIVES

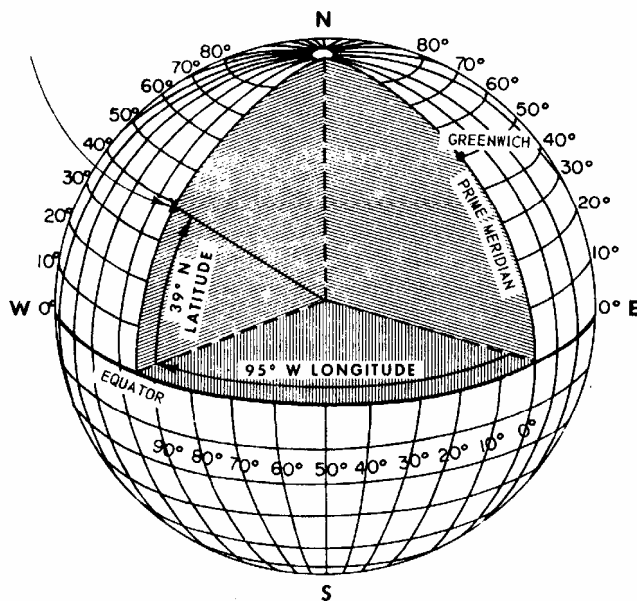
Demonstrate basic knowledge and use of navigational terms. Determine the aircraft's heading and the distance between two points. Given a sectional chart, record a ground feature and transfer that location to a map.

TRAINING AND EVALUATION**Training Outline**

1. As a Mission Scanner trainee, a basic knowledge of navigational terms, the ability to determine heading and distance, and the ability to record a ground feature on a sectional and a map is essential. In order to effectively communicate with the pilot and ground units, the mission scanner must have a clear understanding of various terms that are used frequently when flying aboard CAP aircraft. These are not peculiar to search and rescue, but are used by all civilian and military aviators. The scanner must also be able to track the aircraft's position, and relay the location of ground features to both the pilot and observer and units on the ground.
2. Course. Course refers to the planned or actual path of the aircraft over the ground. The course can be either *true course* or *magnetic course* depending upon whether it is measured by referencing true north or magnetic north. The magnetic north pole is *not* located at the true North Pole on the actual axis of rotation, so there is usually a difference between true course and magnetic course.
3. Heading. Heading is the direction the aircraft is *physically* pointed. True heading is based on the true North Pole, and magnetic heading is based on the magnetic north pole. Most airplane compasses can only reference magnetic north without resorting to advanced techniques or equipment, so headings are usually magnetic.
6. Drift is the effect the wind has on an aircraft. The motion of the airplane relative to the surface of the earth depends upon the fact that the airplane is moving relative to an air mass and the air mass is moving relative to the surface of the earth. Adding these two gives the resultant vector of the airplane moving relative to the surface of the earth. The angle between the heading and the actual ground track is called the drift angle. Drift is corrected by changing the aircraft's heading just enough to negate drift.
5. Ground track. The actual path of the airplane over the surface of the earth is called the ground track. An airplane's track over the ground doesn't always correspond with the direction it's pointed (heading). This is due to the effect of wind (drift). All GPS units will display ground track.
6. A nautical mile is about 6076 feet (sometimes rounded to 6080 feet), compared to 5280 feet for the statute mile. Most experienced aviators simply refer to a nautical mile as a mile. *Scanners and Observers should remain aware of this difference when communicating with ground search teams because most ground or surface distances are measured using statute miles or kilometers.* To convert nautical miles into statute miles, multiply nautical miles by 1.15. To find kilometers, multiply nautical miles by 1.85. Also, one nautical mile is equal to one minute of latitude: this provides a convenient scale for measuring distances on any chart. Nautical miles are abbreviated "nm".

7. A knot is the number of nautical miles flown in one hour. Almost all airspeed indicators measure speed in terms of knots, not miles per hour. One hundred knots indicates that the aircraft would fly one hundred nautical miles in one hour in a no-wind condition. Knots can be used to measure both *airspeed* and *ground speed*.

8. Latitude and Longitude. Navigation begins with is a common reference system or imaginary grid "drawn" on the earth's surface by *parallels of latitude* and *meridians of longitude*. This system is based on an assumption that the earth is spherical. In reality, it's slightly irregular, but the irregularities are small, and errors caused by the irregularities can be easily corrected. The numbers representing a position in terms of latitude and longitude are known as the coordinates of that position. Each is measured in degrees, and each degree is divided into 60 smaller increments called minutes. Each minute may be further divided into 60 seconds, or tenths and hundredths of minutes.



Latitude is the angular distance of a place north or south from the equator. The equator is a great circle midway between the poles. Parallel with the equator are lines of latitude. Each of these parallel lines is a small circle, and each has a definitive location. The location of the latitude is determined by figuring the angle at the center of the earth between the latitude and the equator. The equator is latitude 0°, and the poles are located at 90° latitude. Since there are two latitudes with the same number (two 45° latitudes, two 30°, etc.) the letter designators N and S are used to show which latitude is meant. The North Pole is 90° north of the equator and the South Pole is 90° south of the equator.

Longitude is counted east and west from the Greenwich (zero) meridian through 180°. Thus the Greenwich Meridian is zero degrees longitude on one side of the earth, and after crossing the poles it becomes the 180th meridian (180° east or west of the 0° meridian). Therefore all longitudes are designated either E or W.

Using latitude and longitude, any position on a map or chart can be identified. When identifying a location by its position within this latitude/longitude (lat/long), you identify the position's coordinates *always indicating latitude first* and then longitude. For example, the coordinates N 39° 04.1', W 95° 37.3' are read as "North thirty-nine degrees, four point one minutes; West ninety-five degrees, thirty-seven point three minutes." If you locate these coordinates on *any* appropriate aeronautical chart of North America, you will *always* find Philip Billard Municipal Airport in Topeka, Kansas.

9. Heading and distance. To determine a heading, locate the departure and destination points on the chart and lay the edge of a special protractor, or *plotter*, along a line connecting the two points. Use a marker to trace the

route. Read the true course for this leg by sliding the plotter left or right until the center point, or grommet, sits on top of a line of longitude. When the course is more to the north or south, you can measure it by centering the grommet on a parallel of latitude, then reading the course from the inner scale that's closer to the grommet. [As a "stupid check," note the heading in terms of cardinal points (e.g., N, NW, NNW), and see if this agrees with your first result.]

To determine the distance you're going to travel, lay the plotter on the route and read the distance using the scale that's printed on the plotter's straight edge: one edge measures nautical miles and the other statute miles.

10. Tracking current position. Knowing how to track the aircraft's progress on a sectional chart and a map is essential in order to maintain situational awareness. This, in turn, allows you to accurately mark targets. We previously discussed how to use navigational aids and a sectional chart to plot and navigate a course; the same principles are used during flight to keep track of the aircraft's current position and to record sightings. Besides tracking your position by looking at ground features and following along on your sectional, the pilot or observer can use the VORs, DME and the GPS to update you on current position.

There are a number of ways you can add information to your chart that will help during the flight. Tick marks along the course line at specific intervals will help you keep track of your position during flight (situational awareness). Some individuals prefer five- or ten-nautical mile (nm) intervals for tick marks, while others prefer two- or four-nm intervals. Four-nautical mile spacing works well for aircraft that operate at approximately 120 knots. Since the 120-knot airplane travels 2 nm every minute, each 4 nm tick mark represents approximately two minutes of flight time. On the left side of the course line you have more tick marks, at five-nm intervals, but measured backward from the destination. In flight, these continuously indicate distance remaining to the destination, and you can easily translate that into the time left to your destination.

The next step in preparing the chart is to identify *checkpoints* along the course; you can use these to check your position on- or off-course, and the timing along the leg. Prominent features that will be easily seen from the air make the best checkpoints, and many like to circle them or highlight them with a marker in advance. You should select easy (large) targets such as tall towers, cities and towns, major roads and railroads, and significant topological features such as lakes and rivers. Try not to select checkpoints that are too close together. During a mission, checkpoint spacing will be controlled by the search altitude and weather conditions and visibility at the time of the flight.

11. Recording and reporting position. Being able to record and report the position of a ground feature is a critical skill in all CAP ES missions. Once an aircrew locates a downed aircraft or determines the location of a breach in a levy, they must be able to pinpoint the location on the sectional and report that position to others. Since the details on the sectional chart are often not detailed enough to be useful to ground units, the scanner usually has to transfer that information to a map (e.g., road or topographical).

Using all available tools (i.e., VOR, DME, GPS, and visual references), record the position of the target (e.g., aircraft, levy, spill, or damaged plant) on the sectional. Using lat/long coordinates or the target's relation to observable ground features (e.g., roads, rivers, towns, etc.), transfer the target's position to a road or topo map. [Remember, an important part of planning a mission includes ensuring that you have the same kind of map that the ground units are using, so the position you give them will be easily understandable.]

Additional Information

More detailed information on this topic is available in Chapter 8 of the MART.

Evaluation Preparation

Setup: Provide the student with a plotter, a sectional chart and a map.

Brief Student: You are a Scanner trainee asked to discuss navigation terms, determine a heading and the distance between two points, and given a sectional and a map, locate an aircraft's current position and record the position of a ground feature.

Evaluation

<u>Performance measures</u>	<u>Results</u>	
1. Discuss the use of the following navigational terms:		
a. Course, heading and ground track.		
b. Nautical mile and knot.	P	F
2. Given a plotter and a sectional, determine a route's heading and distance.	P	F
3. Given a sectional, record a ground position by its latitude/longitude and then record that position on a road or topo map.	P	F

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.

P-0101
KEEP A LOG

CONDITIONS

You have been assigned to keep a log on a mission, and must log the actions of your unit, section or team on the ICS Form 214 for use during debrief after the mission.

OJECTIVES

Correctly maintain a log of actions during an incident.

TRAINING AND EVALUATION

Training Outline

1. When working an incident, staff members are required to maintain a log of all significant actions. This is important for record keeping of the accomplishments and setbacks, determining search effectiveness during debriefing, and as a legal record of CAP actions amongst many other things.
2. The mission log is started once a unit or section is opened and maintained until personnel are called in and at home safely to the incident commander. A separate log should be maintained for each varying unit or section that is assigned to the incident, and subordinate units at varying levels will normally also keep a log. This log is turned in with the debriefing paperwork and becomes part of the official mission record.
3. The following actions are always recorded in the log:

FOR GROUND OPERATIONS

- a. Departure and return times to mission base.
- b. Routes taken to and from the search area.
- c. Times of entering and leaving search areas.
- d. Any time the search line changes direction.
- e. Times/locations of clue detections or witness interviews.
- f. Time/location of find.
- g. Time/Location of communications checks.
- h. Any event or action related to the team's ability to complete the sortie requirements (natural hazards encountered, injuries to team members, etc.).
- i. Encounters or instructions from local authorities.
- j. Encounters with the media.
- k. Mileage/Flight time at key intersections, when leaving pavement, at other key locations, etc.

l. Time of distress beacon or other emergency signal acquisition.

m. Times distress beacon located and silenced. Also, if available, include the name(s) and organization(s) of person(s) involved in silencing the distress beacon, the manufacturer, serial number, dates of manufacture and battery expiration, vehicle information (type, vehicle registry, description), and the name of the owner.

n. Personnel assignments to and from the team/unit.

Note: This log (ICSF 214) may be kept as an attachment to the CAPF 109

FOR AIRCREW OPERATIONS

a. Briefing details

b. Names of crew members

c. Engine start time

d. Take Off time

e. Communications checks

f. Time beginning assigned grid or route

g. Time departing grid or route

h. Significant weather, turbulence, other

i. Time of landing

j. Time of engine shutdown

k. Crew changes if any

Note: this log (ICSF 214) may be kept as an attachment to the CAPF 104

FOR MISSION BASE STAFF OPERATIONS

a. Time/date unit or log started or activated

b. Name of unit, supervisor, and individual keeping the log

c. Notes from initial briefing

d. Time and noted from staff meetings

e. Significant events, actions taken, direction received or provided

4. For each log entry, the log keeper writes down the following on the ICSF 214:

- a. The time.
- b. The event taking place (see list above)
- c. Mileage and/or location as appropriate.
- d. Name of individual annotating the log each time there is a change.

Additional Information

More detailed information on this topic is available in each emergency services reference text.

Evaluation Preparation

Setup: Prepare narrative of 10 events/actions and times. Provide the individual with the list, a pen, and an ICS Form 214.

Brief Student: Tell the student that he is the log keeper for his unit, and that the 10 events listed in the narrative have occurred. Tell him to log the events/actions on the on team log form.

Note: this evaluation can be accomplished during a training exercise by observing the events taking place and checking the log to see that they are properly annotated.

Evaluation

Performance measures

Results

For each of the 10 events/actions, the student:

- | | | |
|----------------------------------|---|---|
| 1. Logs the time and event | P | F |
| 2. Writes legibly and completely | P | F |

Student must receive a pass on all performance measures to qualify in this task. If the individual fails any measure, show what was done wrong and how to do it correctly.